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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

DENDROLOGY
FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
GRAZING RESEARCH

January, 1927.

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BRANCH OF RESEARCH

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FOREWORD

What is Research?

Many times during the past year the development of station work, particularly as applied to our experimental and branch station plan, has brought up the question of what is research, what is experiment, and what is demonstration. In such a complex field of work as is ours, the difficulty of fixing exact lines of demarcation between these three branches of effort is greatly increased and has not been recognized except in a rather general way. Doubtless there will always be some difference of opinion as between individuals on particular work, and often confusion as to the determination of where the boundaries between these fields lie and in how far a given piece of work is original in the use made of the data or embodies the essential characteristics of research. But as our investigative work grows richer in experience and in practice and the fields of extension and demonstration become more clearly differentiated, our ideas will undoubtedly become clarified. The boundaries will be shifting constantly because what is truly research at one stage soon becomes demonstration at another, but the principles on which the distinctions are made will remain the same.

It should not be doubted that the essential distinction between research, experiment, and demonstration should be clearly drawn, and that these terms should be restricted to their proper use, at least in our technical and official relations. There are several reasons for this. First of all a distinction is made in Congress as between appropriations for forest research and those for extension. Furthermore, the scientific world has a right to expect of men assigned to research a just conception of the standards and qualities of such activity. And finally, for administrative purposes as well it is essential that we ourselves think and see clearly and thus make those proper divisions of effort and work which are desirable in the Forest Experiment Stations, recognizing our duties and relationships both to the timber growing industry and to the field of science.

The terminology as at present employed means but little. Words are loosely used and often in such a way as to confuse the public, and what is perhaps even more serious, in a way to suggest a confusion in the minds of the individuals using them, of whom a varied service is all too often required. It is true that definitions are difficult to formulate so as to have much meaning, but there are certain quite definite conceptions of research which prevail throughout the entire scientific field. Once these are recognized, other boundaries become clearer and more sharply defined.

One of the most satisfactory definitions of research seems to be, "Diligent, protracted investigation, especially for the purpose of adding to human knowledge . . . . . specifically in science, a systematic investigation of some phenomenon or series of phenomena by the experimental method, to discover facts or to coordinate them as laws." It is therefore scientific; it is systematic; it is extended inquiry; it employs the experimental method; and it proceeds by the discovery of facts which alone or coordinated contribute to understanding or permit laws or principles to be developed.

(Over)

The term "investigation" is largely used synonymously with research. To investigate is "To inquire into systematically; ascertain by careful research." The same general method and character of inquiry are implied in both - "Systematic examination of some scientific question, whether by experiment or mathematical treatment." If there is any difference it is one of degree rather than of kind. Both aim at the advancement of definite knowledge or science. It is therefore the method and essentials of science with which we are concerned in reaching conceptions of research and investigation in any field.

Science is first of all a matter of classification, a bringing together of facts in a system of relation. The function of science is to teach us the relation of facts to each other and their consequences. Science does not teach us the true nature of things - what heat is, what electricity is - it can only give a crude idea of these, but it portrays their behavior, their attributes, and their consequences.

Science, whether for itself or as applied to any particular class of phenomena, is developed through research. In forestry we deal largely with natural phenomena of an endless variety; while the object sought is ultimately practical knowledge or information, the standards of work and the methods must conform to those of science in general and be subject to the same rigorous checks. The method of science is that of observation and experiment, guided and supported by reason and generalization. Observation and experiment teach facts; and in all science, investigation consists in proceeding upward from the fact to the law, and in discovering the facts capable of leading to a law or conclusion. Facts and laws are not artificial or accidental, and are not made by the scientist. Man can only claim originality in connection with their discovery and application.

Observation and experiment are fundamental to progress in natural science. Because of this and because it is better not to see at all than to see wrongly, observations should be made with skill and care and so planned as to furnish a clear, decisive result which can be given a safe interpretation. This is the great secret of success in forest investigation. The subject and the conditionsare usually complex, and the results are more than likely to be complex, embodying a variety of factors and dependent upon many limiting conditions. For this reason the conditions surrounding the experiment should be as simple as possible, and all the limiting factors checked or controlled to the utmost. In this way the number of variants will be reduced to a point where safe deduction can be made as to their several effects. The attempt to make a single experiment answer too many questions - with a result that is often fatal to the whole undertaking - is perhaps one of the most common errors of the over-ambitious and untrained worker.

Facts differ widely in their importance. In the first place we must be sure that what is determined is actually a fact of a permanent character, and not merely the result of a particular combination of circumstances that might never occur again. It means a greater refinement of

method than is usual in the common field experiment, a provision of methods and checks which will bring conditions more largely under control. But even among established facts, some are pregnant and others sterile, some have no comprehensiveness - they teach us nothing beyond themselves, and those who have ascertained them have not become more capable of foreseeing other new facts. On the other hand, there are facts of great import each of which marks a definite contribution or step in advance and foreshadows the way for further progress. Isolated facts in forestry should not always have the constructive value that such facts may have in what is often called the pure sciences, because the investigator should be skeptical of them, knowing the certainty of faulty observation or the erratic behavior of nature. Some have contended that all facts are contributions to knowledge, and that as research depends upon the determination of facts the counting of the leaves on a tree wholly apart from any further connection is research. The results are new facts which apply to the particular case in question, but such facts in and of themselves have no real significance or permanent value, and represent only a routine activity. Their determination does not form a part of a plan or supply a link in a theory, and is not guided by any scientific purpose. No matter how accurate such facts may be, their determination manifestly shall not be what we understand by research. In much the same way the making of stem analyses is in itself not research, although it may be important to that end. Without a guiding purpose which leads beyond a mere determination of a tree's volume, they represent routine work. In research the determination of facts is guided by a purpose and aim, and implies a use.

The determination, then, of isolated facts without deducing from them their causes, consequences, or relationships should not be classed as research. Merely to observe is not sufficient. The observation must be used. We cannot be content with the bare facts of the experiment. To do so would be to mistake the true nature of science. Isolated facts have little scientific value until they are orderly arranged and correlated. The scientist must set in order. "Science is built up with facts, as the house is with stone. But a collection of facts is no more science than a heap of stone is a house."

Underlying all research is a definite purpose - a problem which the investigator means to solve by the marshalling of experimental facts and observations and by their interpretation. Research, therefore, is directed in its selection or determination of facts. It is impossible for us to know all, and hence it is necessary to choose those which are worthy of being known, or which for the time being meet the special needs of our investigation. Hence, also, observation and experiment should not be allowed to run wild, to wander wherever the facts may be, but directed for the time being to the special problem under investigation. Fugitive effort accomplishes little.

The choice of facts is a large element in the method or plan. Research advances by a succession of related experiments skillfully and intelligently planned to supply the needed facts. Individual experiments,

if they form a part of research, are not made at random, or by chance, or to see what will happen, but are made advisedly as a means to an end, and as an outgrowth of the working plan or of what previous experiments have suggested. They should be devised for a definite purpose, and in the belief that they will yield the facts needed. It is a part of the function of the skilled investigator to devise and use ways of getting at the facts needed for his problem.

In a pure science such as mathematics certain facts are considered more interesting than others because they make one foresee a great number of other facts. Obtaining facts of such comprehension that they enable many others to be foreseen is one construction of fundamental research, as it is a justification of the old expression of "Science for science sake."

The most interesting facts are those which may serve many times; these are the facts which have a chance of coming up again. Usually they are simple rather than complex. The investigator in any branch of forest activity must resolve his subject, which is always complex, into the simple factors that comprise it. The main difficulty lies in this analysis. Too often what are really lines of work rather than integral and definite phases have been the object or subject of study.

(To be continued)

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FOREST EXPERIMENT STATIONS

Washington

General

E. L. Demmon, of the Southern Forest Experiment Station, arrived in Washington the latter part of January on a two-months' detail. While here he will become familiar with the general routine of the office.

Mensuration

Haig is still in Washington working on his western white pine yield study. It is expected that he will have the work in such shape that he will be able to return to the Northern Rocky Mountain Station some time in the spring.

The new tabulator has been installed, so that with the additional equipment there has been a decided increase in the output of work during the past month.

Increment Borers

Mr. Frank Haynie, the Property Assistant at Ogden, is now prepared to repair increment borers, and experience indicates that borers so dulled and nicked as to be almost useless can be put into excellent shape.

Library

There were 1119 books and periodicals loaned from the library in January, and 183 members of the Service and others consulted the library in person.

The librarian indexed 207 books and articles for the card catalogue.

Arboretum Bill

The National Arboretum bill providing for acquisition of the Mount Hamilton tract as a great outdoor scientific laboratory for the Department of Agriculture has been placed upon the calendar for possible passage at this session of Congress.

This measure has already passed the Senate and carries the endorsement of the Department of Agriculture, the Garden Clubs of America, and many horticultural and forestry associations.

As it passed the Senate, the bill authorizes an appropriation of $500,000 for acquisition of the property. The House committee on agriculture has reduced the amount to $300,000 and has also stricken out a clause which would make the arboretum available for public use as a park and recreation ground. This latter elimination is made to prevent conflicting authority so that the administration of the arboretum may be undividedly in the Department of Agriculture.

It is held of pressing importance that this measure be approved by the House now, as this virgin territory is threatened with despoliation by real estate development. The owners of practically all of the desired area have agreed to sell at a sacrifice price to the Government, but their offer remains open only to the close of the present session.

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Lake States

The preparation of the Station's Annual Investigative Report and the rounding up of progress reports on approved projects absorbed the bulk of the time and energy of the Station staff during January.

Early in the month Zon made a trip to Marquette, Madison, Milwaukee, Chicago, and Lansing, for the purpose of discussing the Station program and plans for the coming year with our cooperators. At Marquette, he attended the annual meeting of the Upper Peninsula Development Bureau at which he outlined the work done on the Upper Peninsula during the past year and discussed plans for the future development of the branch station at Ruse. At Madison he conferred with the Laboratory in regard to the work yet to be done on the logging study, and at Lansing with the new Director of Conservation, L. J. Young, and others in regard to future relations and cooperation with that Department.

Kittredge compiled a report on the results of thinning in a 15 to 20-year-old red pine stand on the Minnesota National Forest started by Bates and Petheram in 1923. This area was completely burned over in May, 1926, so that no further results are possible. Measurements of the tagged trees immediately after the fire, however, showed that stands such as this are greatly benefited by thinning, the volume of the thinned plot having increased 14 per cent as against 9 per cent for the unthinned plot in the two years following thinning. The stand in question averaged about 5,000 trees per acre with diameters ranging from $\frac{1}{2}$ to 4 inches, and heights from 5 to 23 feet. By thinning from below the stand on the thinned plot was reduced to 1869 trees per acre. In the two years following thinnings, the tagged trees on the unthinned plot increased .08 inch in diameter per year, while on the thinned plot they increased .19 inch. Height growth apparently was not affected, both plots showing an average height growth of .8 feet per year. The thinning produced about 2.2 cords per acre of small cordwood, and cost in the neighborhood of $30 per acre.

An estimate by forties of the stand on the timbered half section of the Station area at Ruse was prepared for the Cleveland Cliffs Iron Company based on the 45 per cent cruise made last summer. This showed a total stand of 2,861,700 feet, board measure, divided as follows:

Hard maple	1,994,100	feet	B.M.
Soft "	27,400	"	" "
Yellow birch	423,400	"	" "
Elm	19,300	"	" "
Basswood	4,600	"	" "
Black ash	30,900	"	" "
Balsam	26,100	"	" "
Cedar	271,200	"	" "
Hemlock	21,700	"	" "
White spruce	39,600	"	" "
Black "	3,400	"	" "

A report was also prepared by Wackerman on the selective logging of the 20 acres cut over last fall. A 100 per cent cruise of this tract before cutting showed a total stand of 127,000 feet, board measure. About one-third of this was marked for cutting, the actual scale of material cut being 45,172 feet of sawtimber and 250 cords of chemical wood. No trees below 22 inches were marked for cutting except where their removal was considered necessary. While on the average, 4 small trees per acre were damaged in logging and had to be cut for chemical wood, there remains on the area at present 181 trees per acre and the appearance of the stand is that of a virgin forest. A striking result of the method of cutting practiced was the high quality of the product obtained, the average value of the logs cut being $27.50 per thousand as against $19 on similar clear-cut areas. Thus while but a third of the volume was removed, approximately half of the value was realized on. Logging of the tract was contracted to local settlers and cost the company $10.50 per thousand and $4 per cord, f.o.b., the net return on the operation being $890 or $44.50 per acre over and above logging costs.

A report was also received from the Division of Agricultural Engineering of the Bureau of Public Roads in regard to the work done in surveying and ditching an eleven-acre swamp on the Minnesota National Forest during the fall of 1926 in connection with the swamp drainage study. Thirty-eight thousand feet of ditch were dug of which 700 feet were required to provide an outlet. The ditches varied from 1 to 3½ feet deep and cost $199, or 87¢ a rod not including surveying and overhead. As the ditches were dug deeper than necessary in order that the water could be maintained at various levels, the cost was higher than would ordinarily be the case.

In connection with the revision of the Bulletin on Forest Planting in the Lake States, the figures on areas planted in the three States were brought up to date. These show that to date, about 73,000 trees have been planted, of which Michigan claims 54,000, Minnesota 13,000, and Wisconsin 8,000. Of the total 39,000 have been planted by the States (34,000 by Michigan alone), 26,000 by the Federal Government, on the National Forests, and about 9,000 by private owners. Fifteen thousand acres in all were planted in 1926.

A report of the results of the scrub oak study made last summer in cooperation with the Michigan State College was also received from that institution.

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Appalachian

General

A very successful meeting of the Southern Appalachian Section of the Society of American Foresters was held at the Bent Creek laboratory on January 15. At this meeting consideration was given a program of work sufficient to occupy the Section for several years.

Consideration of Turpentining Experiments near Wilmington, N. C.

On July 17 Frothingham joined Lenthall Wyman, H. M. Curran, forester of the North Carolina Department of Agriculture, and R. W. Graeber, N. C. extension forester, at Wilmington, N. C., to consider the possibility of turpentine experiments in a young stand of longleaf pine on the Gore Estate, near Wilmington. Mr. Claude Cooper, Secretary of the Gore Estate, conducted the party over the estate.

The naval stores industry which gave the name "Tarheel State" to North Carolina was wiped out with the disappearance of the old-growth forests of longleaf pine. There are now a number of small areas of second-growth longleaf of workable size, or approaching it, in the southeastern part of the State, and there are possibly as much as 3,000,000 acres of land which are a potential source of turpentine and could be brought to a yield condition within two or three decades. Wyman stated that the second-growth longleaf near Wilmington was generally similar to young stands in Georgia and Florida. Although it might yield a little less, due to its more northerly position, it could doubtless be handled profitably under the right kind of management. Any movement to restore the naval stores industry in North Carolina is important from a forestry point of view, since it will place an added value upon forest protection and management. While a suitable demonstration would be exceedingly important and should be encouraged, it was decided that there were no problems substantially different from those now being studied by the Southern Station, so that special investigations in North Carolina are not warranted at this time.

Regeneration after Cutting

Sims has been computing field records from the studies of cut-over areas. The results obtained from the second examination of an area of about 75 acres on the Pisgah National Forest are worth analysis. The cutting in 1919, which was practically a clear cutting, removed 98.7 square feet of basal area per acre. Eighty per cent of this was chestnut, 16 per cent yellow poplar, oak and hemlock, and 3.8 per cent red maple and black

gum. The latter were removed in "sanitation cuttings" to improve the composition of the future stand. Since the cutting the area has been lightly grazed but not burned. Seed trees of poplar were left.

In 1926, 57 per cent of the total young growth consisted of timber-producing species, principally yellow poplar, chestnut, hickory, oaks and hemlock, named in the order of their abundance. Of the total, poplar forms 27 per cent and chestnut 15 per cent by number. The rest of the stand (43 per cent) is composed of dogwood, red maple, silverbell, black birch, black locust, and sourwood, prevalent in the order named. About 70 per cent of the reproduction was of seedling origin, the better species showing a higher percentage than the undesirable ones.

Oak Volume and Yield Study

Buell undertook the computation of oak volume tables early in January. White oak tables for second-growth trees are being computed from about 1,000 tree measurements. This work promises to keep all available members of the staff busy throughout the spring. Volume tables for five species, including about 3,700 trees, must be computed as well as yield tables based on over 400 plots.

Forest Insects

Beal, who has been working on a study of the southern pine beetle, continued winter field trips to study overwintering broods. It was first noted on January 18 that all of the brood examined, which were alive at the last examination, had apparently been killed. On January 14-15 the temperature dropped very suddenly from about 50 to only 7 degrees above zero. Whether the heavy brood mortality was due to weather changes, susceptibility of the insect to injury in the larval stage, or to a bacterial disease, remains to be determined. Examination of a tree on which an attack had earlier been induced by caging showed no blue stain fungous within the caged portion. The wood was heavily stained outside the cage. Person, in the western entomological work, first observed this strange condition on caged trees in which attacks of the western pine beetle had been induced.

In addition to work on the hardwood reproduction project and review of several reports Hursh gave some time to a possible cooperative study of physiological factors which influence beetle attacks in pine.

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California

The California District Investigative Committee held on January 24 to 27 one of the most enthusiastic meetings in its history. Two and one-half days of discussion all pointed to the fact that we have considerable work ahead of us.

The District Forester presided as chairman throughout the session. The administrative organization was represented by nine Forest officers. The entire Station staff was present and the following cooperative agencies participated: the offices of Forest Pathology and Forest Insect Investigations; the Weather Bureau, 3 members of the California Forestry School, the Director of the Eddy Tree Breeding Station, and the State Forester. A better coordinated program was urged by everyone. An endeavor to interest field officers in starting simple experiments and check plots was set up as a primary objective by the committee for this coming year. The Experiment Station was given a splendid send-off with a basketful.. of jobs.

C. J. Kraebel, who is to take charge of the southern California work, comes to the Station February 15. At the Devil's Canyon Nursery 8 seed beds have been prepared and 50,000 Coulter pine seedlings furnished by Los Angeles County are being transplanted. About 10,000 seedlings from other sources will be transplanted this spring. Siggins helped Weaver getting established at the Devil's Canyon Station.

Wieslander is working on the State type map. The lumber industry apparently is much interested in this project and three of the largest timberland owners have turned over their timber cruise sheets and other material for use in compiling the map.

The Station has been asked to advise on the forestry bills introduced at the present session of the California legislature.

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Pacific Northwest

The most unusual activity of the Station this month is the seed dispersal tests which Isaac and Simson have been carrying on. The tests have been made on the level treeless wheat fields of central Oregon where the seeds could be counted upon a mantle of snow by sample strips after they had been released from a kite. Seventeen separate tests were run mostly with Douglas fir, but white pine, cedar and hemlock were also tried. Wind velocities were taken both on the ground and in the air. The kite that carried up the seed and anemometers was a 2½-pound, 5-foot box affair made by Isaac. Lack of wind, snow and rain prevented work on several days and unexpectedly prolonged the job. The British Columbia Forest Service joined in this experiment by sending down A. E. Pickford with some seed. Unfortunately he was taken sick and is now in a Portland hospital.

Since Westveld's return from the East he has been assembling his material on yellow pine slash disposal which is now in shape to be embodied in a final report on this project,- except that we lack quantitative data on the fire hazard in undisposed slash of various ages in comparison with piled and burned areas. We despair of finding a way to determine and rate this important factor by any method other than judgment.

McArdle spent considerable time in checking and revising the tables for his Douglas fir yield study. The computational part of this project is now practically completed, except that one or two more tables may have to be rechecked against the basal data.

Meyer's activities dealt with a number of lines this last month. Finishing touches on the permanent sample plot report, further computations on the effect of understocking of Douglas fir and preliminary computations on a diagnosis of some of McArdle's temporary sample plots were interrupted by a trip to Corvallis. The forest school here owns about 350 acres of forest land known as the Peavy Arboretum and admirably suited to arboretum and demonstration purposes. Projects of an investigative nature will soon be started by the school. Meyer gave several talks to the student body and went over the school forest to become acquainted with the tract and to suggest experiments which might fit in with the Station's work.

Munger prepared a statement for the Advisory Council, reviewing the year's work, in anticipation of the meeting of this committee February 9.

Compilation of the 10-year observations of the pedigreed Douglas fir plantations in the Heredity Study was begun. Altogether there are about 156,000 field measurements of height growth. These have been combined and reduced to 2,352 facts.

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Northern Rocky Mountain

The annual meeting of the District Investigative Committee was held January 13, 14, and 15. In addition to the usual heads of offices and experiment station men, there were in attendance representatives of Blister Rust Control, Bureau of Entomology, and the forest schools of the universities of Idaho and Montana. We were particularly glad also to have with us for the first time two Weather Bureau men. The presence of Mr. Sherier of Denver and Mr. Keyser of Spokane made it possible to get together better than heretofore on our ideas of cooperative phases of fire-weather forecast work.

Weidman attended a meeting of the logging engineers and timber surveys men of the District at which standards of estimating and mapping, allowance for defect, volume tables, and training of men were discussed. Weidman was a member of one of the committees and led the discussion on volume tables. There has been a gradual but decided growing away from the conventional volume tables on the part of those doing timber estimating and appraisal in District 1. For several years the men have been using almost entirely a volume table which consists simply of three columns headed D.B.H., Logs per M, and Scale of Ave. Log per Tree. There are three or four such tables for the District, the values of which differ according to the form of the timber being cruised. These tables are used on the ten commercial species of the region and appear to check out fairly satisfactorily. Form as indicated by the scale of the average log of a tree (derived by dividing its total scale by the number of logs) is the basis

of the several volume tables. This is an index of form readily understood and measured by the timber estimators, and yields a volume table the construction of which they thoroughly understand. These considerations, coupled with the fact that these tables are adapted to the practice of cruising by logs per tree and logs per M, seem to comprise the chief reasons for the discarding of the conventional volume tables in District 1. Another reason seems to be that the conventional tables compare so poorly with actual checks. It should be mentioned in this connection that timber estimating here is done chiefly by permanent Forest officers specializing in timber work rather than by inexperienced field assistants as in some other localities.

Although the sort of universal volume tables now being used here have a fairly sound mathematical basis, form (as it varies by diameter classes and localities) has not been adequately studied and allowed for. Moreover, it appears from a little inquiry into these points that to allow for them adequately may mean subdivision into a considerable number of tables of this sort. And this would defeat one of the advantages of such tables. It is believed that the solution is either the making of scientifically based form-class tables, or the making over of all our standard volume tables to overcome their present inaccuracies and to put them in form for cruising in logs per M. A study of the situation with a view to this end is to be made cooperatively by the Office of Management and the Experiment Station.

Compilation of field data and the preparation of reports has been the burden of work on the part of all the men this month. In addition to coding the lightning storm reports for 1926 and the preparation of a progress report on behavior of fires, Gisborne has been doing the annual calibrating of his duff hygrometers, using for this purpose the electric drying oven at the University of Montana forestry school.

The conference with Mr. Sherier and Mr. Keyser of the Weather Bureau resulted in selecting seven existing and two proposed weather stations which will report by telegraph each day to Spokane to aid the Spokane forecaster in localizing the regional weather forecasts. All of the existing stations are now being operated by the Forest Service and very little additional equipment will be needed. Gisborne will accompany Mr. Keyser on an inspection of as many of these stations as can be visited early in the spring to check the accuracy of instruments, install new ones where necessary, and complete the arrangements with the local Forest officers for submitting reports and receiving the forecasts.

Wahlenberg has finished a report of his study of Ceanothus brush in relation to the survival of yellow pine plantations. Instrumental observations on one of the areas showed that from June to September 1926 the evaporating power of the air under brush was less than half that of adjacent open spaces. On calm, clear days relative humidity was greater under the bushes than in the open. The maxima, minima, and means of soil temperatures for the upper eight inches of soil were lower under the bushes than in the open spaces. The range in temperature of both air and soil was greatly reduced under the Ceanothus. More important, perhaps, is the reduction by the brush of extreme temperatures occurring at the surface of

the soil. These were observed to run as high as 145°F. in the open and not above 94°F. under the bushes. Soil moisture available to western yellow pine during the dry summer period was progressively diminished at all points, but remained greater under the bushes than in the open. A little available moisture still was left under Ceanothus on August 7, at which time the supply in the open had become exhausted. This indicated that the conditions of drought, which were rapidly approaching at all points, had developed to a degree fatal to planted trees first in the open. Theoretically, then, the trees planted in the open were dying in larger numbers than those under the brush. An examination of all the trees on August 20 showed a survival of 53 per cent in the open, 68 per cent at the intermediate position, and 89 per cent under the brush. Rains soon prevented further losses from drought and it was obvious that the Ceanothus had helped the yellow pine through its first hard season.

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Rocky Mountain (December and January)

December Activities

The first few days of December were spent by Bates in writing and illustrating a paper "Light Intensities Required to Produce Growth of Coniferous Seedlings," and by Roeser in preparing "Heat Tolerance of Coniferous Seedlings," both of which were presented by Bates before the Physiological Section of the Botanical Society of America at the A.A.A.S. convention in Philadelphia. These papers were based on the most recent (1926) data of the T-8 and T-2 projects, respectively. The light requirement experiment confirmed the conclusions derived from the 1924 tests and allotted the several species more exactly by comparing the dry weights of seedlings after starving for 9 months in reduced light with corresponding weights just after germination in full light. A range of 1 to 5 per cent of full sunlight was established as representing the minimum requirement for all species tested. Redwood (Seq. semp.) was found by far the most efficient tree both in regard to minimum light requirement and growth under the various light intensities existing in the experiment. Engelmann spruce and Douglas fir followed redwood, while pinon, whose position was left in doubt in the 1924 test, proved itself, as has always been believed, very inefficient and depending for its quick start in life upon the abundance of food material contained in the seed.

Roeser's heat tolerance test involving lodgepole and yellow pines, Engelmann spruce and Douglas fir indicated that resistance of seedling stem (the most vulnerable part of the plant to this form of injury) depends primarily upon the promptness of development of stout heat-resistant tissue of the stem, and represents a mechanical rather than a physiological adaptation. Soil temperatures up to 125° F. are unlikely to cause injury to 50-day-old seedlings, while above this, yellow pine shows greatest resistance and

lodgepole least. At 100 days both pines show themselves more resistant than Douglas fir and Engelmann spruce and general resistance has increased about 15° F.

After a week or so spent in the preparation of the report for the District Investigative Committee, Bates and Roeser represented the Station at the meeting in Denver on December 16-18. Bates then left for Philadelphia and following this spent January in Washington working up the Wagon Wheel Gap streamflow records in cooperation with Prof. Henry of the Weather Bureau. Incidental work in connection with the pending lodgepole seed bulletin and the T-8 report were also attended to.

Roeser completed the computation and tabulation of data for the general Engelmann spruce volume table (Me-146), On the last day of the year he completed the work of tagging and measuring the check plot of the demonstration plots established in the Black Forest on a school-land section in conjunction with the State forestry department.

January Activities

Practically all of Roeser's time was spent in working up a part of the large number of lodgepole pine measurements made within the past 20 years in D-2, as the preliminary step in the preparation of a series of general taper curves for this species for use in the District. Some time was also spent in tabulating and summarizing the 1926 lodgepole pine (Mt-103) measurements on the Washakie Forest.

With Bates absent in Washington, Roeser took charge of the office. A trip was made to the Fremont Laboratory every ten days during December and January to assist Rambo in weighing and watering the large T-7 cans in the transpiration test.

Germination and growth in the new T-5 (nutrient) series are progressing favorably in most of the pots except in those containing quartz sand. The results in these are very disappointing, the very heavy, and in some cases complete, loss being undoubtedly due to the inability of seedling roots to establish capillary connection with the very coarse and angular soil particles.

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Southwestern

Almost the entire month has been devoted to progress reports and other work connected with the District Investigative Committee. A report embodying the deliberations of the committee, together with statements of progress and recommendations, has been prepared and will be distributed. Among the features emphasized is the cooperation obtained from the Biological Survey and the Bureau of Entomology and the prospects of still

closer cooperation in the future. We are coming more and more to realize that the animal life of the forest is not merely a problem of control or extermination but a matter which must be approached from a broad standpoint based upon thorough understanding. The bark-beetle problem which has not heretofore been regarded seriously in District 3 is presenting new angles which may prove of very great importance. Cooperation between forest research and grazing research, with a common viewpoint in regard to the conservation of basic resources, is another step in the right direction.

The staff of the experiment station is being strengthened by the assignment of a new man from the district organization for the primary purpose of continuing the brush disposal study. While this study will demand the greater portion of his attention, he will also be available for other investigative work.

Status of Manuscripts Received

Washington

"Yield Tables - How Many Plots?" L. H. Reineke. (To Jour. For.)

Appalachian

"Factors Controlling Germination and Early Survival in Oaks." C. K. Korstian. (To Yale School of Forestry for publication as bulletin of the School series.)

Pacific Northwest

"Timber Growing and Logging Practice in the Douglas Fir Region." T. T. Munger (Department Bulletin) to printer.

In Print

Bates, C. G. "Some Relations of Plant Ecology to Silvicultural Practice." (Ecology, October, 1926.)

Munger, T. T. "Restocking Habits, Fir Types. (West Coast Lumberman, December 15, 1926.)

Kotok, E. I. "Restocking Habits, Western Yellow Pine Types." (West Coast Lumberman, December 15, 1926.)

Beal, J. A. "Frost-killed Oak." (Journal of Forestry 24: 8.)

Zon, Raphael. "Cost of Logging Large and Small Logs." Address before Northern Hemlock and Hardwood Association, published in The Lumber World Review, August 10, 1926.

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FOREST PRODUCTS - WASHINGTON OFFICE

Cooperation - General Supply Committee

That part of the General Schedule of Supplies of the General Supply Committee covering Lumber, Millwork, Boxes and Building Material was reviewed and revised for use in connection with the awards to be made for the fiscal year 1927-1928.

RE,Census - Wood Preservatives

The schedules were mailed to the cooperators on the tenth; at the close of the month returns had been received from about 35 per cent of the treating plants.

Special List of Lumber Associations

The annual revision of this list was started during the month. Returns from about half of the associations included in the list were received.

Price Data

A compilation of price data obtained from manufacturers of hardwood products in New England shows considerable variation in prices paid for beech, birch and maple bolts and logs. Prices for bolts for turnings as spools and novelties usually range from $10 to $16 a cord at the mill. This stock could formerly be purchased for as low as $3 a cord, although the usual price 15 or 20 years ago was $5 to $6. Prices for logs generally range from $15 to $30 a thousand board feet at the mill.

These price variations are dependent to a large extent on supply, the higher prices usually applying to regions altogether or largely cut out and the lower prices to regions usually distant from factories where extensive cutting has not been carried on.

OFFICE OF FOREST PRODUCTS - DISTRICT 1

Note: The Table of Contents for the November Monthly Report carries the statement that the District One Forest Products Report was not received. This is an error, as the District One Report was received but by mistake was included under the heading "Forest Products-Washington Office."

Lumber Census

During January the 1926 canvass has been gotten under way in Montana and Idaho. The mailing lists for the first request mailed include 590 firms or individual sawmill owners, of which 263 were in Montana and 327 in Idaho.

Montana Forest and Timber Handbook

Page proof for this publication has been corrected and the Handbook should be ready for distribution during the month of February. An edition of 3700 copies, including 200 with buckram covers, is being printed by the Montana Forest School. Distribution to be handled jointly by the School and this office will include besides members of the Service and forest schools all Montana sawmill owners, timber products producers, wood-preservation plants, retail lumber yards and wood-using industries and all forest agencies in the State, libraries, schools and county agents.

Lumber Prices and Movement

	Annual 1925	First Q. 1926	Second Q. 1926	December 1926
Idaho white pine	$37.37	$37.10	$38.65	$36.65
W. yellow pine	28.02	29.33	28.14	24.09
Larch - Fir	19.33	19.33	18.05	16.81
White fir	20.14	19.79	19.86	17.07
Spruce	24.38	23.60	25.68	23.74

	December, 1925	December, 1926
Cut	115,165 M	88,596 M
Shipments	130,294 M	115,509 M

	Annual, 1925	Annual, 1926
Cut	1,865,046 M	1,742,613 M
Shipments	1,713,282 M	1,792,638 M

Miscellaneous

The District Investigative Committee meeting was held January 13 to 15. The Products' program proposed for 1927 was approved.

January was devoted principally to office work in connection with the sawmill studies project, preparation of the proposed publication, "The Air Seasoning of Western Softwood Lumber," and the 1926 lumber census.

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FOREST PRODUCTS - DISTRICT 5

Air Seasoning

Mr. Brundage worked during a large share of the month on extensive information in respect to the past project work in this District requested by Mr. Fullaway of D-1, who has been assigned to the preparation of a combined bulletin on the air seasoning of western softwoods. The unexpectedly large amount of work required to prepare this information was due to the different organization of material or point of view involved from that upon which our own results were based.

Technology

Through the cooperation of Mr. L. H. Daugherty, Assistant Forest Pathologist, it proved possible to identify to species the sample of unfossilized Miocene sequoia obtained by this office some time ago from a mine in the Sierras. The specimen proves to be Sequoia penhallowii Jeffrey, on the diagnostic basis of Penhallow's North American Gymnosperms.

Marine Piling

Considerable time is still required from Mr. Hill in the process of putting the final report of the San Francisco Bay Marine Piling Committee into the press.

White Ants

Some time was spent in correspondence and otherwise in an endeavor to forward the possibility of a California trip by Mr. Hunt of the Forest Products Laboratory, and Dr. Snyder of the Bureau of Entomology, in connection with the white ant damage in Southern California and the proposed protective provisions for the Pacific Coast Uniform Building Code. A call from Mr. K. C. Barth, Director of Research of the Western Red Cedar Association in connection with the annual convention of that association in San Francisco developed a very interesting situation in respect to the association's effort to hold their pole business as against the inroads of pressure-treated Douglas fir and southern pine poles stimulated by white ant ravages.

In the last week of the month Mr. Hill complied with the urgent request of a San Francisco hardwood wholesaler for assistance in combating an infestation of white ants threatening serious loss in their large foreign lumber storage building.

Moisture Content Project

Considerable preliminary work was done in lining out the project work in this District on this unexpected project. Considerable help in respect to the approach to the industry was given by the secretary of the California Pine Association. On the 27th of the month, Mr. French arrived from the Laboratory, and on the following day he accompanied Mr. Brundage on a trip for the collection of the samples.

Heptane

A rapid turn toward early activity in starting a producing operation in Jeffrey pine was indicated by a letter from the Laboratory desiring all the data that could be supplied for a conference on the 26th of the month with the Ethyl Gasoline Corporation. These data were dug out and transmitted to the Laboratory.

Lumber Census

Pending action on the suspension of Census Bureau reimbursement to this District for expenses incurred in the last year's canvass, no action was taken in respect to the sending out of this year's schedules. Recommendations were made to the Forester covering revision of the card form census schedule to supplement the inter-district recommendations for the large biennial form being prepared by Mr. Fullaway of D-1. Arrangements were also requested from the Forester to obtain a tabulation of the California lumber cut for 1925 by counties.

California Economic Research Council

On January 4 at a meeting of the Committee on Natural Resources, Consulting Pathologist E. P. Meinecke presented a statement in considerable detail of the bearing of pathological factors upon economic value of the timber resources. Agreement was reached respecting action to be taken by the committee looking toward the preparation of a climatic handbook for California. Subsequent to the meeting, conferences were held with Major Bowie, District Forecaster of the U. S. Weather Bureau, and Mr. Hill presented in a letter to the California Development Association a proposed program for bringing the publication about. As a result of conferences with Major Bowie, Chief Engineer Hyatt of the State Division of Water Rights and District Engineer McGlashan of the United States Geological Survey, a plan of action was also started looking toward the inauguration of systematic snow surveys for this State.

Forest Service Cooperation

On request of the Laboratory, the status of the kiln brown stain situation and possibilities for future cooperation were canvassed with the Pine Association. Apparently this project will have to lie over for the present season.

At the request of the Office of Operation, the creosote situation was investigated and recommendations made for treatment of Forest Service bridge timbers and other improvement structures.

Miscellaneous

January 24, 25 and 26 were taken up with the sessions of the District Investigative Committee. Conferences of the District Training Committee were also participated in by Mr. Hill.

Assistance was given to Mr. Sanborn, who is studying the problems of waste utilization for the Union Lumber Company, a redwood operation.

General Survey of Woods Waste in the Douglas Fir Region

Field data computations were continued during the month. The amount of waste at eleven camps, exclusive of that in stumps, snags and uncut trees, has been computed and tabulated, giving some interesting results. For example:

The smallest amount of material (all classes) found on a single acre of logged-off land was 5,260 feet, the largest amount per acre 43,660 feet.

The average amount of material (all classes) per acre for the company leaving the least material on the ground was 7,887 feet, for the company leaving the most material, 28,052 feet; the average amount (all classes of material) per acre for the eleven camps was 17,590 feet.

The smallest amount of sawlogs (working plan classification) found on a single acre was 2,470 feet, the largest amount per acre 24,100 feet.

The average amount of sawlogs per acre for the company leaving the fewest sawlogs was 4,650 feet, for the company leaving the most sawlogs 17,548 feet; the average amount of sawlogs per acre for the eleven companies already studied was 9,545 feet.

The sawlog data were collected on the basis of three classifications. The specification adopted for Class 1 sawlogs gives a class of material which the industry might be expected to log under present economic conditions, or slightly improved conditions.

The smallest amount of Class 1 sawlogs found on a single acre was 290 feet (120 feet of hemlock and 170 feet of western red cedar); the largest amount per single acre, 23,800 feet (9,750 of Douglas fir, 13,400 feet of western hemlock, and 660 feet of Sitka spruce). The average amount of Class 1 sawlogs per acre for the eleven companies was 6,615 feet (2,809 feet of Douglas fir, 3,362 feet of western hemlock, 183 feet of cedar, and 261 feet of spruce.)

The average amount of material left per acre consisted of:

Class of Material		Average Amount (feet b.m.)
Class 1 sawlogs	6,615	
" 2 "	800	
" 3 "	2,130	
	9,545	9,545
Pulpwoods (mostly western hemlock, some Sitka spruce		3,000
Cordwood (mostly Douglas fir)		4,500
Shingle bolts (western red cedar)		317
Poles and piling (Douglas fir and western red cedar)		36
Posts (western red cedar)		192
Total		17,590

Lumber Census

To date, January 29, the "first request" has not been mailed out; the forms have not been received from the Census Bureau.

Among those who are in a position to have a worth while judgment, the feeling is that the lumber cut of Oregon and Washington for 1926 was as high as in 1925, possibly higher. The 4-L Bulletin estimates the 1926 cut of these two States at 15 billion, the Timberman at about 10½ billion; this office estimates the cut at about 11½ billion.

In 1925 the lumber cut of Oregon and Washington was higher than in any previous year, amounting to 11,243 million, as compared to 9,931 million in 1924, 10,644 in 1923, 8,860 in 1922, 5,854 in 1921, 8,842 in 1920, and 4,640 million in 1915.

The following figures, which were compiled for inclusion in an article for The Timberman, are of interest. It will be noted that the lumber cut in the western States has practically doubled in the last decade.

Production of Lumber in Western States and the United States
by Years
(Million feet B. M.)

State	1915	1920	1921	1922	1923	1924	1925
Arizona	76	121	46	89	131	143	146
California-Nevada	1,130[1]	1,513[1]	1,350	1,721	2,118	1,996	2,043
Colorado	75	70	41	39	38	42	71
Idaho	777	970	543	858	1,073	1,018	1,141
Montana	328	410	214	303	427	350	389
New Mexico	66	112	95	126	126	125	152
Oregon	1,690	3,317	2,022	3,024	3,966	3,664	4,216
South Dakota	23	45	27	35	49	51	47
Utah	11	8	7	7	8	7	5
Washington	3,950	5,525	3,832	5,836	6,678	6,267	7,027
Wyoming	17	8	6	8	8	14	16
Total	8,143	12,099	8,183	12,046	14,622	12,877	15,253
United States[2]	37,012	33,799	26,961	31,569	37,167	35,931	38,338

[1]Does not include the small cut of Nevada.

[2]Does not include Alaska.

Cargo Shipments, Oregon and Washington, 1926

The following statistics of water shipments from Oregon and Washington in 1926 are of interest when considered from a statistical point of view only. They also throw light on the organization of the lumber industry in these two States, their markets, also why certain practices are or are not followed by the Douglas fir industry. For example, they will throw considerable light on the general attitude of this industry toward the matter of seasoning of lumber.

It will be noted that nearly five billion feet of the annual lumber cut of the west side of Oregon and Washington, or slightly more than one-half the lumber cut of this region, is "water" shipped. This shipment consists of green lumber; the lumber does not stain, and it takes just as low a freight rate as it would if dried. More than 25 per cent of the cut, or two and one-third billion feet, consists of clear stock, stock that is kiln dried. On this basis there remains but two and one-third billion feet of common lumber that must be consumed locally or rail shipped, the bulk of which lumber is sold locally, in California, or other near-by markets accustomed to using practically green lumber. The thought is that there is not the urge to season common lumber in the Douglas fir region as in some other lumbering regions.

Water Shipments from Oregon and Washington, 1926

(feet b. m.)

State	Export	Domestic	Total
Washington	1,010,831,581	2,542,098,018	3,552,929,599
Oregon	471,274,336	823,116,905	1,294,391,241
Total	1,482,105,917	3,365,214,923[1]	4,847,320,840

[1]California took 1,662,918,681 feet, the Atlantic Coast 1,667,138,155 feet.

A review of the German payments to France under the Dawes plan for the past two years reveals the important place German timber is playing in the payment in kind. The first year of payments, France was not interested in receiving payment in kind except in coal, coke, and chemical products, fearing restricting of markets for domestic products. The goods received in the first year did not disturb domestic markets, however, with result that the payments in the second year were more largely devoted to payment in goods. The value of the timber used by Germany in these payments in 1926 amounted to 18,million gold marks, ranking high in the list of commodities used for payment. In the first two months of the 1927 year beginning September 1, 1926, the value of timber was 4½ million marks.

There is considerable speculation as to the extent to which France can receive goods in payment, but there seems to be agreement among economists that she can receive a great deal more timber. Can Germany supply it?

Oak Stumpage Prices by Regions

We are accustomed to high prices for second-growth softwoods in the older timber regions, but it comes as a matter of surprise to many that second-growth hardwoods are equally high. The following table showing weighted average stumpage prices of oak by regions brings out the importance of second-growth values in old established regions.

Stumpage Prices: Oak by Regions

Region	Total Quantity M.ft.L.S.	Price per M.	Virgin Quantity M.Ft.L.S.	Price per M.	Second-growth Quantity M.ft.L.S.	Price per M.
United States	968,250	$6.28	683,639	$6.03	286,171	$6.89
New England	11,801	8.61	780	7.27	11,021	8.70
Middle Atlantic	42,566	7.95	6,063	9.44	36,493	7.70
Lake	10,310	10.53	9,433	10.88	877	6.84
Central	234,556	8.55	115,863	7.98	118,693	9.10
Appalachian	115,863	6.37	88,421	6.39	27,442	6.29
South Atlantic	69,821	6.20	51,317	6.41	18,504	5.63
Lower Mississippi	484,903	4.89	411,762	5.19	73,141	3.17

These figures are a combination upon a weighted average basis of the stumpage price reports from private companies in 1924 and 1925. The classification of the timber into growth groups made by the reporter was used as the basis for segregation of prices. Undoubtedly much timber which might be thrown into culled virgin under a more strict classification is included in second growth. In the reports for all regions and for all species there is a tendency on the part of the reporters to throw any timber

of doubtful growth into the second-growth classification. In other words, the virgin timber tends to be really virgin while the second growth may include cull virgin as well as second growth.

The United States average of $6.89 for second-growth oak is higher than the United States average for virgin timber because of the greater relative quantities of second growth in the high-priced regions. The stands of the lower Mississippi region run heavily to virgin timber and the quantity being much greater than that in any other region, reduces the United States weighted average of virgin timber.

Normally the prices in the Central region would be thought to be the highest in the United States. This is true in certain parts of the region, but the prices brought in the territories along the fringe of the region tend to reduce the regional average. The price shown for the Lake States more nearly represents the values in the main part of the Central region than do the averages for the region itself, because the Lake States prices apply to timber in the southern part of the region, a part in which conditions are very similar to those in Ohio and Indiana.

These prices bring out regional differentials. At the present time the bulk of our supply of oak lumber and other products come from the Lower Mississippi region which is the lowest priced region of all. It is likewise the latest region to be opened up in a big way. In many instances the conditions from a point of view of national supply of hardwoods in the Lower Mississippi region are analogous to the position of the Pacific Northwest in the softwood industry. Both regions are now going through a second blocking up period, so to speak, the lumber industry, although well established, is now undergoing a new development period resulting in great increases in production capacities. The regional export to other regions is increasing rapidly. In the wake of this development there is a tendency for secondary industry to move into these regions.

Meanwhile the second-growth values in the older regions mount, despite the lower quality of the stands. The advantages of greater accessibility of stands, good roads, ready markets not too far distant and well-developed industries, creates price levels higher than those in the more distant regions.

Newsprint Production in North America in 1926

The newsprint service Bureau announces that the production of newsprint in North America in 1926 broke all existing records when it climbed to 3,768,000 tons. Of this tonnage, Canada supplied 1,882,000 tons, the United States 1,686,000 tons, Newfoundland 186,000 tons, and Mexico 13,000 tons. Canadian production for the first time surpassed that of the United States, a fact which established Canada as the leading newsprint-producing country of the world.

The combined production of the United States in 1926 exceeded the 1925 records by 17 per cent. Canadian production increased 24 per cent, while the United States increase was but 10 per cent. The year's gain in the production in Newfoundland amounted to 93 per cent, being made possible by the start of operations in the new $25,000,000 mill backed by the governments of Great Britain and Newfoundland.

All but 19,000 tons of the United States production was kept within the country for consumption. Added to this 88 per cent of the Canadian production and 49 per cent of the Newfoundland production were likewise consumed in the United States. The Newsprint Service estimates that 100,000 tons of the available supply for the United States in 1926 went into stocks, thus placing the consumption at about 3,400,000 tons. This amounts to a per capita use of 58 pounds, 6 pounds greater than in 1925.

This great increase in the consumption of newsprint in the United States is due to increased circulation of papers, both daily and Sunday, and to the great increase in the size of papers. The increase in circulation of dailies amounted to 7 per cent in 1926, and in Sunday papers to 5 per cent. In 1926 the newspapers in the class of 100,000 circulation and over averaged 31 pages daily and 111 pages on Sunday as compared with 23 pages daily and 79 pages on Sunday in 1920.

United States Paper Production in 1925

Preliminary figures released by the Bureau of the Census place the total paper production of the United States at 9,182,204 tons in 1925. The 1925 production amounts to 1,152,722 tons or nearly 15 per cent greater than the 1923 production.

In the following table the 1923 and 1925 production figures for the most important paper grades are compared:

Kind of Paper	1925	1923	Per cent increase, 1925
	Short tons		
Total	9,182,204	8,029,482	
Newsprint	1,647,277	1,576,509	4.4
Book	1,367,595	1,228,530	11.3
Fine (writing)	473,804	377,029	25.7
Wrapping	1,297,919	1,184,234	9.6
Boards	3,280,710	2,792,832	17.5
Tissue	281,243	250,616	12.2
Building papers	555,231	344,695	61.1
All other	278,245	275,037	1.2

The greatest percentage increase between 1923 and 1925 is shown in building papers. This is due to a slightly different classification made by the Census in 1925, which brought other papers into the group. The two figures are not strictly comparable.

The apparent consumption of paper in the United States in 1925 was 10,590,093 tons as compared with 9,339,579 tons in 1923, an increase of 13.3 per cent. The following table shows the production, imports, exports, and apparent consumption of paper by important grades in 1925.

Kind of Paper	Domestic production	Imports	Exports	Apparent consumption
	All short tons			
Total	9,182,204	1,543,320	135,431	10,590,093
Newsprint	1,647,277	1,448,425	22,738	3,072,964
Book	1,367,595	9,087	11,182	1,365,500
Wrapping	1,297,919	9,995	20,809	1,287,105
Boards	3,280,710	52,692	43,591	3,289,811
Fine	473,804	1,620	3,527	471,897
All other	1,114,899	21,501	33,584	1,102,816

Estimated Completeness of Lumber Production Census, 1925

On December 6, 1926, the Districts were asked to report estimates of the completeness with which the Census in the 12 western States gets the facts of lumber production. The compiled replies are presented in the following tables:

The situation is shown in two ways: First, by the number of mills from which reports were secured, compared with the total existing mills as known to the District; and second, by the quantity of lumber reported as compared with the quantity missed. The indications of the combined report are gratifying.

Out of a total of 2,621 mills, 157 were missed, or 6 per cent of the total. Of these some probably were idle. On the basis of cut, the total of which is over 15 billion feet, 29 million feet were missed, or .2 of 1 per cent. The average cut of the 157 mills missed was about 180,000 feet, which is an indication that very few mills which had any considerable cut escaped the canvass.

In this census the western Districts canvassed about 12 per cent of the mills of the United States, and reported 40 per cent of the national cut.

Estimated Completeness of Lumber Production Statistics, 1925 in 12 Western States Canvassed by the Forest Service, as Reported by District Foresters

Table I. Estimate by Number of Mills

Mill Class and District	Total mills	Mills accounted for: Showing cut	Mills accounted for: Idle	Mills not accounted for: Number	Mills not accounted for: Per cent of total
	No.	No.	No.	No.	Per cent
Mills cutting Over 200 M ft.					
District 1	192	143	49	..	0.0
" 2	111	100	11	..	0.0
" 3	40	39	1	..	0.0
2/ " 4	11	11	0	..	0.0
" 5	188	124	64	..	0.0
" 6	910	732	128	50	5.5
	1,452	1,149	253	50	3.4
Mills cutting Under 200 M ft.					
District 1	325	217	94	1/14	4.3
" 2	299	219	72	8	3.7
" 3	107	71	35	1	0.9
2/ " 4	59	59	.0	.	0.0
" 5	146	77	65	3/ 4	2.7
" 6	233	149	4	80	34.3
	1,169	792	270	107	9.2
All mills					
District 1	517	360	143	1/14	2.7
" 2	410	319	83	8	2.0
" 3	147	110	36	1	.7
2/ " 4	70	70	..	.	0.0
" 5	334	201	129	3/ 4	1.2
" 6	1,143	881	132	4/ 130	11.4
	2,621	1,941	523	157	6.0

Footnotes on following page.

1/ A generous estimate. Probably half of these mills idle.

2/ Approximations by Washington office, as District 4 reported merely that every mill in the District is known and accounted for.

3/ A few very small mills in the redwood region may have been missed. In addition, there are a few small hardwood mills in the States, cutting principally imported species, which are not included in this estimate.

4/ It should be observed that lumber is cut in 65 counties of Washington and Oregon. The failure to secure two fairly small mills per county would make up the total of 130 mills not accounted for.

Table II. Estimate by Quantity of Lumber

Mill class and District	Lumber cut: Total	By mills accounted for	By mills not accounted for: Quantity	Per cent of total
	M ft.	M ft.	M ft.	Per cent
Mills cutting Over 200 M ft.				
District 1	1,516,671	1,516,671	..	0.0
" 2	114,148	114,148	..	0.0
" 3	290,034	290,034	..	0.0
2/ " 4	110,000	110,000	..	0.0
" 5	2,037,689	2,037,689	..	0.0
" 6	11,245,133	11,230,133	15,000	0.1
	15,313,675	15,298,675	15,000	0.1
Mills cutting Under 200 M ft.				
District 1	15,569	14,619	1/ 950	6.1
" 2	15,121	14,431	690	4.6
" 3	7,406	7,306	100	1.4
2/ " 4	3,000	3,000	..	0.0
" 5	5,796	5,746	3/ 50	0.9
" 6	25,575	13,575	12,000	47.0
	72,467	58,677	13,790	19.0
All mills				
District 1	1,532,240	1,531,290	950	0.0
" 2	129,269	128,579	690	0.5
" 3	279,440	297,340	100	0.0
2/ " 4	113,000	113,000	..	0.0
" 5	2,043,485	2,043,435	3/ 50	0.0
" 6	11,270,708	11,243,708	27,000	0.2
	15,386,142	15,357,352	28,790	0.2

1/ A generous estimate.

2/ Approximations by Washington office, as District 4 reported merely that every mill in the District is known and accounted for.

3/ A few very small mills in the redwood region may have been missed. In addition there are a few small hardwood mills in the State, cutting principally imported species, which are not included in this estimate. The quantity missed is infinitesimal.

FOREST TAXATION INQUIRY

The Forest Taxation Inquiry is concentrating on two lines of investigation: First, the problem of public finance as it affects typical counties in northern Minnesota, and analysis is being made of the sources of public income and the principal lines of expenditure in an effort to show the extent to which the State contributes to the support of these counties and the residual burden resting upon the taxpayer. It is hoped this study will indicate savings in public expenditure which might be effected by a sane policy of land classification and the concentration of agricultural development in areas better suited for that purpose. The study of the burden upon the individual taxpayer covers seventeen townships in four counties. Over five thousand separate forties were examined in the field, and the value of the different parcels will be determined for comparison with the assessed valuation and the taxes imposed.

The cooperative agreement with the University of Wisconsin is in process of adoption, by which the Inquiry will have the benefit of an investigation by that institution which has been in progress for a year on lines almost identical with that pursued in Minnesota. Mr. Paul Herbert will have direct supervision of this project.

R. C. Hall has initiated the project of determining stumpage values for the various regions to be studied, which work will be continued during March and April at Washington, D. C.

The Minnesota legislature is considering the entire project of forestry and its connection with forest taxation through a committee which contemplates the introduction of one or two bills during the present session.

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Washington

Feed Resources, Eleven Western States

The mimeographed copies of these statistics and preliminary analyses mentioned in the November report which have now been sent to the field for further consideration show strikingly the value of range and other pasture in furnishing feed for livestock in the eleven Western States. The following excerpts and notes give some of the outstanding features from a range and pasture standpoint:

One-third of the gross farm income of the West comes from the sale of livestock or livestock products. Livestock is the only means whereby crops from vast areas can be turned into a product useful to man. If one is to get a correct picture of the agriculture of the West, the contribution of the various types of range has to be evaluated.

The total for the eleven western States shows that harvested crops contribute 22 per cent of the feed requirements, plowable pasture 15 per cent, other farm pasture including controlled range 18 per cent, the National Forests 10 per cent, and the other nonfarm 35 per cent.

In eight States the other nonfarm contributes more feed than is obtained from harvested crops. In three States this range contributes more feed than all the crops and farm pasture combined. (Much farm pasture in the West is range.)

States arranged in order of approximate magnitude of range feed are Montana, New Mexico, Colorado, Arizona, California, Wyoming, Oregon, Idaho, Utah, Nevada, and Washington. On the basis of value of all pasture including range California moves up to second place and Washington displaces Nevada for the tenth place.

Beef cattle consume nearly one-half the entire feed available and more than twice as much as any other type of livestock. Sheep come next.

Beef cattle consumed 38 per cent and sheep 13 per cent of the harvested crops fed livestock.

ANIMAL UNIT DAYS PER ACRE - PASTURE

State	FARM		NON-FARM	
	Plowable	Other Farm Pasture	National Forest	Other
Arizona	100	8	9	6
California	83	12	5½	6
Colorado	35	11	10½	7
Idaho	100	12	7	8
Montana	35	12	7	8
Nevada	80	5	6	2½
New Mexico	27	10	7½	6
Oregon	85	11	6	6½
Utah	75	8½	8	5½
Washington	100	12	5	6½
Wyoming	33	10	8	6

Animal unit days per acre are obtained by dividing the total animal unit days of feed provided by the total acreage, or by dividing the length of the pasture season by the acres required to support a cow. In Colorado, New Mexico, Wyoming, and Montana, the plowable pasture contains considerable dry land pasture, while in other States it contains irrigated pasture or lands along the west coast where a high rainfall occurs.

The data for the forest range are the result of actual records. "Other Farm" and "Other Non-Farm" were obtained mainly by comparison with the forest range. The poorest non-farm range was found in Nevada where it is largely uncontrolled public domain, the best in Idaho and Montana. Other farm pasture is principally fenced or controlled dry land range exclusive of public lands and is slightly better than the non-farm range.

Livestock is fed longer as one moves north or in areas where considerable fattening is done. Beef cattle generally are fed for longer periods than sheep.

In Arizona the forest range supplies more feed than the farm pasture and more than twice as much as is obtained from harvested crops. About 90 per cent of livestock feed comes from range land, since much of the other farm pasture is actually range.

In Colorado and Idaho the National Forests and open range furnish more feed than harvested crops which furnish 30 per cent of the livestock feeds in these States.

In Montana less than twenty per cent total feed comes from harvested crops. Nearly twice as much feed comes from open range as from harvested crops. Farm largely dry land range furnishes over twice as much feed as harvested crops.

Two-thirds of livestock feeds of Nevada are largely derived from public domain.

In New Mexico less than ten per cent of total feeds comes from harvested crops,over 90 per cent from range. Farm pasture, most of it dry range land, furnishes five times as much feed as harvested crops. The balance is from National Forests, public domain, large holdings and other open range.

In Oregon slightly over one-fourth of livestock feeds comes from harvested crops. One-half of the feeds secured by grazing comes from other non-farm, largely public domain and intermingled lands.

The forest range of Utah furnishes two-thirds as much feed as harvested crops and more feed than farm pasture in that State. One-half of livestock feed comes from other non-farm, largely public domain, range.

Nearly 50 per cent of the livestock feed of Washington comes from range lands. Over one-half of the feed obtained by grazing is from lands not in farms. Feed from Washington National Forest ranges is lowest quantitatively and proportionately of the feed requirements of the State than for any of the eleven western States.

Over 85 per cent of the livestock feed of Wyoming comes from range and farm pasture, the latter largely dry land range.

Proposed Grant to New Mexico Agricultural College

Representative Morrow of New Mexico has introduced a bill in Congress which proposes to grant several townships of public domain adjoining the Jornada Range Reserve to the New Mexico Agricultural College for purposes of range livestock experiments. Several years ago the college purchased some heifer calves from the Jornada herd and used them in a feeding test in a cooperative project with the Forest Service on one pasture of the Reserve. The next year the college purchased two wells and obtained the leases on State lands adjoining and controlled by these watering places. The proposed grant would consolidate all the land usable from these wells under State control. The college plans to enlarge its range cattle investigations and undertake work with sheep and goats also.

Forage Investigations

The outstanding event was the return during the month, in two installments, of at least 800 plant specimens from the Bureau of Plant Industry. Owing to the clerical situation, not all of these have yet been reported on to the collectors, but the preliminary lists of all, at least, have been made. Seventeen collections, with lists and notes, were reported on to the Districts during the month. One collection was submitted to B.P.I. Three hundred and thirty-three photostatic prints of economic-notes cards were distributed during the month. Three hundred and forty specimens were mounted, and approximately the same number were labeled, foldered, and deposited in the herbarium. Several specimens were mounted on United States Museum sheets and deposited in the National Herbarium.

Some Botanically Interesting Plant Specimens of the Month

1. Junior Range Examiner Ashbel F. Hough's No. H-78, our No. 51915, from the Stanislaus National Forest, Agropyron violaceum. The first record of the occurrence of this species in California. A mount of it has been provided for the United States National Herbarium.

2. Mr. Hough has also submitted a rush (Juncus sp.) from the Stanislaus, his No. H-12½, our No. 51947, collected a half mile east of Mt. Lewis, which Dr. Coville thinks may possibly be an undescribed species.

3. Junior Range Examiner W. G. Koogler's No. K-1, our No. 50696, Muhlenbergia texana, from the Datil National Forest. This is the first time this prevailingly Mexican grass has been collected in the United States outside of Texas. Part of the material has been kept for the United States National Herbarium.

4. Junior Range Examiner B. A. Hendricks' specimen No. 23, our No. 50702, from the Datil National Forest, is an unmatched cucurbit which he calls "wild cucumber." According to Dr. J. N. Rose of the United States Museum, probably our leading American authority on the taxonomy of cucurbits, there are only two echinopepons in the United States, E. confusis and E. wrightii, and this specimen seems not to match either one. Mr. Tidestrom has, however, very tentatively (and with a mark of interrogation) referred this sheet to E. confusis Rose,- presumably with Dr. Rose's approval.

5. Associate Range Examiner C. K. Cooperrider and Junior Range Examiner R. F. Copple's joint specimen No. E-3, our No. 50460, from the Tonto National Forest, is apparently the first record of the collection in Arizona (and certainly so in central and southeastern Arizona) of goldentop grass (Achyrodes aureum) which has been considered to be confined to California so far as its American range is concerned.

6. Mr. Chas. H. McDonald's No. 486, our No. 51723, Elymus ambiguus, from the Uinta National Forest. The first record of the occurrence of this species in Utah. The specimen has been deposited in the United States National Herbarium.

Bulletins

The browse bulletin has gone to Mr. Hunn for editing. The glossary is in Mr. Chapline's hands again. Additional work has been done with the reseeding bulletin and the Southwestern forage bulletin; the former it is hoped to have in Mr. Chapline's hands early in February.

(Lupine or Mildew?) Poisoning of Horses on the Sequoia

Junior Range Examiner C. S. Robinson of the Sequoia states that on September 18 last Forest Guard Allen reported to him the loss of two horses in Little Troy Meadow, a fenced pasture five miles southeast of Beach Meadow on the Sequoia. Mr. Robinson states that Lupinus covillei is common in Little Troy Meadow, and also that he has found the common knotweed powdery-mildew (Erysiphe polygoni) abundant on Coville lupine at high elevations of the Sequoia Forest, but adds that he was unable to examine the stomachs of the affected animals.

Cases of the poisoning of horses by lupine seeds are, of course, on record. The mildews are commonly regarded as poisonous plants (see Pammel), but Dr. Marsh of B.A.I. seems to be skeptical as to their causing losses of livestock under western range conditions.

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SANTA RITA RANGE RESERVE

Range and Stock Conditions

Both range and stock continue in good condition despite the fact that the rainfall for January was only .23 inch, which is one inch below the past twenty-five-year average. The days and nights are getting warmer and some green growth has already started over all parts of the Reserve, due largely to favorable soil moisture conditions holding over from December rains. A few good rains within the next few weeks should assure an excellent crop of spring forage. Some observations have already been made on spring growth of perennial grasses. Browse species have not shown any growth to date.

Personnel

Mr. H. E. Moseley, temporary clerk, was called home on January 12, on account of illness in his family, and inasmuch as his appointment was to terminate at the end of the month, it was not considered worth while to have him return, and consequently his appointment was terminated and the Santa Rita is again clerkless.

Director Gulley spent the week of January 10 to 15 inclusive attending the District 3 Investigative Committee meeting in Albuquerque and returned via the Jornada where two days were spent in the field going over project work with Director Schoeller. Condition of the range on the Jornada clearly indicates what deferred grazing, accompanied by a good year, can do in the way of producing vegetation on a semidesert range.

Meetings

The District 3 Investigative Committee meeting proved an extremely interesting and beneficial session with Grazing Research firing the opening gun and still going strong at the finish. It would be impossible to even list here the many things that came up for discussion; let it suffice to say that considering only the urgent projects scheduled for study during the coming year there will be no scarcity of work for Grazing Research personnel. Among other things discussed was the question of assigning District 3 Rangers to the Range Reserves during the summer field season. Another objective, discussed at some length, was that of having the Range Reserve personnel arrange to go over the different Forests in the District, with a view to not only putting investigative results into practice but, which is equally important, to keep themselves in touch with the administrative viewpoint and problems. Mr. Pooler gave his assurance of all possible cooperation in the carrying out of these plans, even to the point of financing them from District 3 funds if it were not possible to secure Range Investigation funds for the purpose.

Visitors

Mr. P. H. Ross, Director of Extension work in Arizona, paid a brief visit to the station on the afternoon of January 30, and said that he was planning to come out very soon again and make a day of it in order to go over some of our project work in the field.

GREAT BASIN STATION

Miscellaneous Notes

Mr. Gerald D. Pickford, who received his degree in forestry at Ames last spring, and who was field assistant at the station last summer, reported on January 3, to assist in compilation of data. Mr. Pickford was appointed as assistant compiler for a three-months' period.

Nelson will spend several months during the winter compiling a report for publication on plant succession in the black grama grass type in the Southwest under various systems of grazing. Mr. Nelson gave personal attention to this study while he was on the Jornada, and while devotion of his time to this study detracts from compilation and analysis of Great Basin data, it was agreed that he is the best prepared to handle this job. The report will cover 9 years' work, under several methods of grazing and highly diversified rainfall conditions. The results will be of much value in the management of the black grama type.

Forsling attended the annual meeting of the Idaho Woolgrowers at Weiser, Idaho, on January 17 and 18. He delivered an address at this meeting on "The Solution of Problems in the Management of Grazing Lands." He also attended the meeting of the State Extension Workers at Logan, Utah, on January 14 and 15, where he discussed matters to be included in a range extension program.

District Investigative Committee Meets

The District Four Investigative Committee held its annual meeting on January 3 and 4. Progress and plans for 1927 were considered for the Station, as well as administrative projects in range management and Forest management. No changes were proposed in the Station program, and bringing compilation and analysis of data already obtained up to date as soon as possible was emphasized as having high priority. Two new projects, effect of burning on the range, and water development studies, were introduced by members of the committee. Recommendations were made that the Station take these projects under consideration for the next year without undertaking any field work.

Considerable attention was given to the needs of studies both administrative and more purely research projects in range and Forest management. More administrative projects are needed to answer local problems, to work out the detail of the application of results of research for local conditions and to increase the interest of the administrative men in studying their own problems. On the other hand, more research is needed in both Forest management and grazing than is being done at the present time. Problems have come up which cannot be solved without the aid of research. In the meantime, they must be handled on judgment, a method which is not always conducive of the best results.

Attempt was made this year to bring in as much outside viewpoint as possible. In addition to members from the Service, the meeting was attended part of the time by F. R. Marshall, Secretary of the National Woolgrowers' Association, Director William Peterson and Dr. Geo. Stewart of the Utah State Experiment Station, W. A. Denecke, Superintendent, U. S. Sheep Experiment Station, Dr. A. W. Sampson, Professor of Range Management, University of California, W. S. Candland, Utah State Senator and Woolgrower, L. A. Wall, Range Examiner, District 3, and M. L. Merritt, Assistant District Forester, Alaska. A regular Advisory Council for the Station is contemplated, and the invitation to interests outside the Service to sit in and take part in the discussions is a step in that direction.

Effect of Summer Rainfall on Underground Water Supply

In the course of the discussion during the meeting of the Investigative Committee, it was brought out in connection with the erosion and streamflow project, that under conditions where this study was made, the summer rainfall (July to September, inclusive) is dissipated by evaporation, transpiration, and surface run-off, and that none of this moisture ever enters into underground run-off. Moreover, as the herbaceous vegetation is increased up to a maximum, surface run-off and probably direct evaporation from the soil is decreased, but that the greater the amount of vegetation the greater the return of water to the air by transpiration. The annual average rainfall during the season considered is 4.97 inches, or 17 per cent of the average annual run-off.

Director William Peterson of the Utah State Experiment Station told the committee that findings by his workers, who have carried on considerable study of underground water supply, agreed with those of the Great Basin Station in that none of the summer rainfall enriches the underground supply, and that he is of the opinion that all underground water in Utah and similar regions is derived from the winter snow.

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JORNADA RANGE RESERVE

Range Conditions and Precipitation

Very little precipitation has fallen this month but temperatures have been mild and the December moisture was such that winter weed growth has made considerable progress. Cattle throughout this locality as well as on the Reserve are wintering well and prospects for the immediate future are good.

The final precipitation figures for the calendar year 1926 show an average of 18.21 inches for ten stations on the Jornada. The highest precipitation for any one gauge was 21.17 inches at St. Nicholas Canyon and the lowest 14.67 at Red Lake. The rainfall at the Station headquarters amounted to 17.42 inches. With the exception of Red Lake all of the figures exceed any previous record for this locality; the nearest approach having occurred in 1905 at the State College, when 17.09 inches were recorded.

Investigative Committee Meeting D-3

Schoeller attended the District Three Investigative Committee Meeting in Albuquerque January 10-13 inclusive. The meeting was well attended by personnel from other Departmental Bureaus as well as the Forest Service.

Among other things brought out in the discussions relating to the two Range Reserves was the question of detailing certain of the District Three Administrative Personnel to the Range Reserves during the field season, both for training purposes as well as to help out with the work. It was also the general opinion of the committee that the Directors of both Range Reserves should endeavor to spend some time each year on the District Three Forests for training purposes. The District Forester expressed a willingness to finance both these proposals in so far as was possible and plans are being made accordingly.

Visitors

Director Gulley of the Santa Rita Range Reserve put in two days, January 17 and 18, on the Jornada going over projects in the field and discussing matters more or less common to both Reserves.

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GRAZING RESEARCH, D-3

The first week of January was spent in field work in connection with palatability determinations, natural revegetation studies and life history records. Comparative palatability records have been kept in connection with the browse range work and in particular for determinations of palatability forage in range reconnaissance. The method has been that of determination of average species growth under range use as compared with growth in protected or controlled use plots and the measurement of the amount of growth remaining or taken at certain regular intervals. Locations for study have embodied the various concurrent associations and various degrees of utilization. Such work on palatability very strongly confirms the old opinion that it is what should be and not what will be taken that should govern and that the comparative value of a species in the association is the palatability rating of real merit.

Cooperrider attended the meeting of the District Investigative Committee at Albuquerque. The period from January 7 to 25 was spent either in attendance, reporting the proceedings, or travel to and from the meeting of the committee. Copple spent a similar period of time in the field.

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GRAZING RESEARCH, D-6

Monthly Reports from the D-6 Grazing branch have been conspicuous by their absence the past two months. This should not be construed as a lack of interest in the "Monthly Report." Far from it! This delinquency is due partly to shock sustained as a result of the major operation performed on the article reporting currently in the October issue on the "Grazing of Cut-over Areas" project.

The major fact which this article purported to show was that after a two-year trial, sheep could successfully graze on Douglas fir cut-over lands at a profit to the owner. "Proof of the pudding in the eating" was certainly apropos here.

So far as known this is the first proof of record, and this fact perhaps needed greater emphasis - hence, bears repetition.

Concentration by the one-man organization here on the immense amount of compilation and analysis necessary to digest the data secured duringthe past two field seasons is a real reason for the admitted delinquency. This condition has been accepted as a matter of course.

Reading the Great Basin's contribution in the December issue with its appeal for "more funds," however, really inspired this effort. Mere mention of this figure of speech induced a forward movement of the ear lobes. It was truly comforting to find others in a similar predicament.

Having reached the identical conclusion that taking on more research only invites disaster, we are likewise impressed with the importance of hanging on to the bear's tail. Too ambitious in youth, we have developed a jealous old age as regards throwing away important projects once started. Hence, the catchy slogan, "More Funds for Grazing Research Work."

In addition to compilation work, the University of Oregon and Oregon Agricultural College have been furnished with duplicate specimens of some 500 D-6 plants. Some 600 additional plant specimens collected in 1924, 1925 and 1926 have been submitted to Washington for identification. Many of these were collected in connection with the "Grazing Management of Cut-over Areas" study, and a strenuous effort is being made to bring the District herbarium up to date.

Serious items on other phases of the "Grazing Management of Cut-over Areas" are in preparation for the "Report." If the knife must be applied on these - Well, gently, brother Editor, gently.

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